Battle Command
Toppling the Tower of Babel

Colonel Stuart A. Whitehead, U.S. Army

As night fell, the situation grew threatening. Marcone arrayed his battalion in a defensive position on the far side of the bridge and awaited the arrival of bogged-down reinforcements. One communications intercept did reach him: A single Iraqi brigade was moving south from the airport. But Marcone says no sensors, no network, conveyed the far more dangerous reality that confronted him at 3:00 a.m: He faced not one brigade but three: between 25 and 30 tanks, plus 70 to 80 armored personnel carriers, artillery, and between 5,000 and 10,000 Iraqi soldiers coming from three directions: The Iraqi deployment was just the kind of conventional, massed force that is easiest to detect. Yet, "We got nothing until they slammed into us," Marcone [says].[1]

ALTHOUGH THIS FIGHT turned out favorably for U.S. Armed Forces, we must do better as we strive for commander-driven, network-enabled joint operations. The challenges of today's battlefield are many and evolving but so, too, are the insights and technologies to improve Battle Command. Today, we question doctrine in light of new understanding and changing circumstances. Military professionals discuss the commander and his staff on the one hand, and technology and the network on the other—but rarely at the same time. This must change because there is a symbiotic relationship between the two, and Army governance and acquisition processes need to reflect that fact.

The Commander and His Staff

Many see the commander as a charismatic leader on a white horse, surveying the panorama of the battlefield from the high ground; assessing the situation based on his observations, experiences, education, and the written reports of subordinates; and issuing instructions by visual or acoustic signal. But advances in technology have increased battlefield lethality and operational distances, limiting how much of the battle the commander can observe and requiring his presence at key locations and times. The portion of the battlefield he cannot observe has become the purview of his staff, who synchronize operations and dispense situational awareness.

As staffs have grown and become more specialized, so have the technologies that support them. Twenty-five years ago, staff specialists who managed the fight and made recommendations to the commander filled command posts while radio communications allowed the commander to untether himself from it. However, achieving situational awareness was still a manual process requiring the posting of information provided by each operating system onto a consolidated map or series of maps. With the advent of computers, each battlefield operating system automated its manual processes and disseminated information over separate, dedicated networks. There was no concerted effort to make the various systems mesh; as a result, systems became stovepiped.

As weapons systems and communications became more capable, responsibilities increased, requiring better management and integration of combat resources and service capabilities. The need to deconflict fires with airspace command and control (C2) and to convey accurate situational awareness of friendly and enemy locations and actions are just two of the requirements that finally led the Army to integrate Battle Command systems.

Today, increases in the lethality and range of weapons systems and the greater complexity of the battlefield require commanders at increasingly higher echelons to manage operations in real time. As a result, commanders have come to depend on computer-provided information as they make decisions they hope will get them inside the enemy's decision cycle and maintain the initiative. The need for better systems integration as well as continuous network connectivity and bandwidth at lower echelons has also increased dramatically.

However, the Army's Battle Command capability is still a collection of stovepiped systems that share information over an incredibly complex multitude of networks. How bad is the problem? In Iraq, 184 systems operate over 11 different networks in a costly, manpower-intensive array inadequate for the expeditionary capability we seek for the future. Moreover, at the battalion level and below, units often do not have the means, bandwidth, or connectivity to operate effectively on the move.

Old thinking. How we think and organize to solve problems says as much about our understanding of the world in which we live as it does about the problems. For example, the evolution of staff organizations and technology reflects in large measure man's interest in science and his desire to explain nature through formulaic truths. This desire or tendency is called linearity.

Linearity is evident in such terms as battlefield geometry and lines of operation and in the way we organize our services, focus our acquisition process on capability sets, and resource and catalog individual programs in our budget lines. Linearity is quantifiable, reasonably precise, and predictive, all seemingly useful attributes when one has to operate in the kind of chaos war entails. We assume we can deconstruct the force into subelements, develop the subelements optimally, then combine them to achieve synergy. That is the theory anyway, and while weapons effects seem to bear this out, it has not yet been achieved at the informational level.

New thinking. An ancient Sufi text reads: "You think because you understand *one,* you must understand *two,* because one and one make two. But you must also understand *and*."[2] That might sound esoteric, but it refers to interaction. When two men play chess, they see each other and have total, real-time situational awareness, but one of them will lose to the other. Why? Because the chess match is not just about the rules and the pieces on the board; it is about humans, the decisions they make, and their interaction with each other. With every move a player must ask: What is the meaning of what I am seeing? Is it a ruse, a sacrifice, or a mistake? With every move the conditions of the match change. There is no sterile recipe or numerical equation to ensure success. The key to victory is nonlinear thinking—understanding the changing nature of the conflict and being able to exploit an opponent's transient vulnerabilities at the right time and place.

So what might a nonlinear approach to warfighting look like? If we are successful, it will be our Future Force—a nonlinear Army of modular units in a joint, interdependent force that conducts expeditionary operations from a variety of locations in the continental United States (CONUS) and overseas. It will mobilize and train from disparate locations; conduct long-distance, virtual team building; connect to ongoing operations and intelligence gathering; perform mission planning and rehearsals en route; and achieve plug-and-play C2 of joint, interagency, and multinational components.

The future joint C2 environment will allow information sharing between and across echelons. By definition, the Future Force will be composed of self-contained, standardized components connected to each other and headquarters and able to operate in concert. The technology and network implications are huge.

Warfighter Involvement

Future network and systems design should be commander-centric and seamless. Historically, warfighters determined a desired capability, then "threw the task over the fence" to a material developer to find a solution. Subsequent warfighters monitored capability achievements but did not look under the hood. As a result, each program of record performed the functions expected of it, but different system-design foundations precluded interoperability. When we merged systems, as with the Army Battle Command System (ABCS), the problem grew exponentially. We had created a Battle Command "Tower of Babel." By taking a linear approach, we optimized the design of the individual parts, but we overlooked the group context in which they had to operate.

To achieve an expeditionary-level Battle Command system, we will have to build interdependence by establishing context. Units operate under a commander's direction and our Battle Command systems inform his decisionmaking. We must identify the capabilities the commander needs to plan, prepare, execute, and assess operations, as well as understand that they are part of a continuum in which all our systems operate.

Doctrine should drive process. A nonlinear approach to problem solving requires interaction to define and establish relationships between organizations and understand where, when, why, and how they interface. The military planner must ask: Who else should know? Forming multidisciplinary workgroups composed of all stakeholders will normalize their interaction through thoughtful implementation of doctrinal and engineering principles, which is the focus of interaction—the *and.*

Direction and consensus. So how do we achieve interdependence? Through consensus. But building consensus is an arduous process. It is tempting to believe that one authority should direct operations, but the problems are too broad and complex, and when it comes to coalition partners, the United States has no authority to direct their compliance. In addition, commercial investment research and development funds drive many of our solutions, and private corporations respond to market forces more than government edicts. Today, a major effort is underway to implement an Army consensus-building and decisionmaking structure that includes joint, interagency, and multinational inputs.

How we organize speaks volumes about our understanding of the problem. A forum composed of the Army Staff, the U.S. Joint Forces Command, sister services, the U.S. Army Training and Doctrine Command, and others is developing a campaign plan to migrate our current Battle Command capability over time. The forum is integrated, multidisciplinary, and inclusive of acquisition, resourcing, testing, leader education, training, and fielding equities. Decisionmakers integrate programs within this context to facilitate the Future Combat System's (FCS's) entry into the current force. Such a decisionmaking structure reflects a dramatic change from business as usual, reorienting organizations and programs, slicing through stovepipes, and overturning rice bowls.

Key concerns. Many areas merit attention and consensus, including data strategies, force management, acquisition, capability migration, architecture design, data transport, security, bandwidth allocation, software design, battlespace visualization, adaptive planning and execution, applications and embedded models, and simulations. Focusing on one area—data standards—might be illustrative.

Attempts have been made over the years to develop or mandate data standards, but they have been largely unsuccessful for three reasons:

1. In a laissez-faire environment, systems developers have tended to accept, reject, or modify standards with a kind of Wild West mentality, and over time commonality has been lost.

2. Developers complain that a common standard will not meet their specific system requirements because one data model does not fit all needs. Although C2, simulation, and geospatial data have some common characteristics, the developers are right.

3. Because the Army prefers to deconstruct problems and organize efforts by specialties, warfighters do not concern themselves with system development beyond identifying requirements. As we have learned through the school of hard knocks, there are many ways to implement the same requirement, but without warfighter assurance of doctrinal correctness, the solutions might be unsuited for the battlefield.

The New Lingua Franca

When two C2 systems exchange information, challenges arise that are similar to those of a man discussing shopping with his wife. She describes a shirt as azure. He says blue. They are using different descriptors to convey the same idea. The challenge is exacerbated when more than two systems exchange information. Meta-data tagging and extensible markup language help somewhat, but they do not get to the heart of understanding context. We need better solutions for systems that rely on accuracy and speed of service.

One attractive solution is to converge data models. Merged data models eliminate ambiguity, establish useful exchange standards, and set the conditions for the more robust, native data models we need for future systems and applications. For example, the plan, prepare, execute, and assess requirement implies integrating C2 with simulations and geospatial terrain generation. The more work we do now at the data level to enable interoperability, the less we will have to do later with mapping, translation, and transport.

Developing a consensual, nonproprietary, information-exchange standard that meets holistic needs and is well documented, enforced through governance, and implemented through careful engineering practices, will achieve the interdependencies we seek.

Today, if we want to share information with coalition partners, we send them an ABCS suite and a liaison team. While this is useful, the air gap between U.S. and coalition systems prevents real-time situational awareness, especially for critical information concerning Blue Force locations. As a remedy, the Multi-Lateral Interoperability Program, a 24-nation effort, created the Command and Control Information Exchange Data Model (C2IEDM), a consensually agreed-on standard that allows coalition partners to share information directly between C2 systems. C2IEDM has been adopted by NATO, which added an air tasking order; chemical, biological, radiological, and nuclear information; and maritime graphics to the model. The NATO Data Administration Group manages the configuration of the Joint Consultation Command and Control Information Exchange Data Model (JC3IEDM). This is the start point of data model convergence between C2, simulations, and terrain data. The C2IEDM has already been selected by the FCS program and is under consideration by the Defense Information Systems Agency for Joint Command And Control (JC2). The C2IEDM exists today as a multinational interface with our C2 systems and will be included as an injector in the Joint Tactical Combat Operational Picture

Work Station, co-developed by the Army and Marine Corps. This effort will also serve as the foundation for a common information exchange standard needed for our publish-and-subscribe service, the key to network-centric enterprise services and future-to-legacy C2 interoperability.

Global force management. Global force management is another initiative implemented by the joint staff J8. Based on force structure, a common C2IEDM-based data model, and a unique identifier, global force management allows us for the first time to understand battlefield entities in time and space. We can now define entities and their relationships to others and ascribe a unique identity to every item on the battlefield. The data model defines the type of tank platoon. The unique identification designates it as 2d Platoon, C Company, 4-69 Armor. We can also link this information to the Blue-Force tracking capability and network and even assign Internet Protocol (IP) addresses to the entity. Essential to the Future Force's plug-and-play capability, entity-relationship data will integrate readiness reporting and personnel and logistics information.

Systems acquisition. Also essential to Future Force capabilities is systems acquisition. Until recently the Army's approach to interoperability was to integrate two or more existing systems to increase speed of service or eliminate errors. The ABCS is a prime example of existing systems modified to exchange information more efficiently or to provide a new capability. However, the integration process is fraught with obstacles: systems, technical, programmatic, and certainly emotional. We have learned much from this experience, in particular to move to a system-of-systems acquisition approach.

The current JC2 effort is potentially groundbreaking in its interservice approach. But, while the current view of mission space is holistic, some suggest dividing the space into strategic, operational, and tactical sectors—a move back to linearity. But our forces operate in battlespaces that do not parse so conveniently. Similarly, while dividing JC2 into mission-capability packages lends itself nicely to the division of labor and acquisition, it could replicate stovepipes. The warfighter and acquisition communities must create effective working groups and governance to achieve an interdependent capability that places the system-of-systems context ahead of individual programs. Finally, we must remember that we are a joint force at war. We cannot take time out to develop and field new Battle Command systems. Unit mission load, competing budget needs, and training and interoperability challenges temper Battle Command improvement.

The Future of JC2

The Army has a campaign plan to take us to the interoperable future of JC2. When mature, the next generation will consist of only two systems (one if you consider the converging standards of JC2 and FCS). These systems will use broadly accepted human-machine interfaces that will reduce the training burden and rationalize system solutions. We will consolidate servers and networks; rationalize services and applications; and support it all with a mobile, adaptive network environment, thus ensuring that ground warfighters get all the information and access they need to conduct Future Force operations.

The Army and the joint force are at a critical juncture. Forces in the field have found our Battle Command solutions wanting. We must—

- Improve Battle Command capability.
- Build a bridge from the past to the future in a coherent way that does not disrupt the effectiveness of our forces.
- Unite commanders and technology in such a way as to enable both to successfully meet future nonlinear challenges.
- Prioritize design efforts to support human-dimension needs.
- Tear down the Tower of Babel through the careful selection and application of standards.
- Bridge the bandwidth digital divide with prudent allocation of resources.

The Way Ahead is difficult. Our Nation and allies depend on us for success in future military operations in an environment that is increasingly dangerous and complex. Now is the time to discard irrelevant systems and adopt new approaches that better meet the needs of our contemporary and future operating environments. ***MR***

NOTES

1. David Talbot, "How Technology Failed in Iraq," *MIT Technology Review* (November 2004).
2. Anonymous, quoted in Daniella Meadows, "Whole Earth Models and Systems," *Co-Evolution Quarterly* (Summer 1982): 98-108, quoted in Margaret J. Wheatley, *Leadership and the New Sciences* (San Francisco, CA: Berrett-Koehler Publishers, Inc., 1999), 10.

Colonel Stuart A. Whitehead, U.S. Army, is the Director, U.S. Army Training and Doctrine Command Program Integration Office for Battle Command, Fort Leavenworth. He received a B.S. from the U.S. Military Academy, an M.S. from Central Michigan University, and is a graduate of the U.S. Army Command and General Staff College and the U.S. Army War College. He has served in various command and staff positions in the continental United States, Germany, Kuwait, Kosovo, and Turkey.